Trend Study 16C-30-99

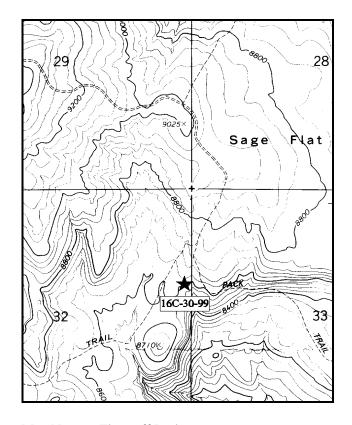
Study site name: <u>Upper Hole Trail</u>. Range type: <u>Mixed Mountain Brush</u>.

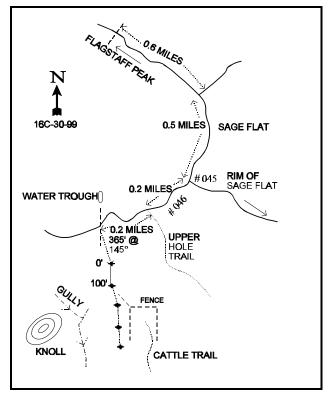
Compass bearing: frequency baseline 181°M.

Footmark (first frame placement) <u>5</u> feet, footmarks (frequency belts) line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Wrigley Springs Reservoir, continue SE 3.0 miles to the T-intersection by Flagstaff Peak. Turn left towards Sage Flat. Go 1.65 miles and cross a cattleguard. Continue straight 0.9 miles to a fence and cattleguard by a pond. Continue SE 1.0 miles to the Sage Flat seeding. Go 0.6 miles to a fork. Continue straight on the main road about 0.5 miles to a fork. At this point, a road that runs along the rim of Sage Flat takes off to the left (#045). Turn right at 0.35 miles on F.S. Road #046. Continue south 0.2 miles to the Hole Trail. Go another 0.2 miles on the main road to an old fence line by an unused water trough. The study starts about 100 yards south of the road. The first baseline stake, a 2' green fencepost with browse tag #9020 attached, is along an old fence line.





Map Name: Flagstaff Peak,

Township 20S, Range 6E, Section 32

Diagrammatic Sketch

UTM 4320734.339 N, 477350.307 E

DISCUSSION

Trend Study No. 16C-30 (31-28)

The Upper Hole Trail trend study is located near Sage Flat. The area around Sage Flat and South Sage Flat on the southeast side of Ferron Mountain is listed as important elk winter range although there was little elk sign encountered in 1994, but sign increased substantially in 1999. It is an open sagebrush community with scattered mountain brush, mostly on the slopes. The study itself is located in a low saddle between the large sagebrush flats, in a mixed mountain brush type near the edge of the cliffs where the Upper Hole Trail climbs up from the pinyon-juniper country below. At the study site, slope is 12% with a southern exposure. The elevation is 8,600 feet. This Forest Service land is in the Ferron allotment and is grazed by cattle in the summer from June 21 to October 5. Pellet group data from 1999 estimate 5 deer, 32 elk and 31 cow days use/acre (12 ddu/ha, 79 edu/ha, and 77 cdu/ha). Rabbit pellet groups are very numerous. Most of the elk pellet groups are from last winter, but some are from this spring ('99). About 40% of the cattle pats are from this season, while the rest are from last season. Cattle were in the area during the 1999 reading.

The soil has a clay loam texture with a neutral pH (7.3). The soil depth is moderately deep with an effective rooting depth estimated at almost 16 inches. Phosphorus and potassium are limited at just 2.6 ppm and 54.4 ppm respectively. Values less than 10 ppm for phosphorus and 70 ppm for potassium have been shown to limit normal plant growth and development. There is some rock on the surface and within the profile and there is a compacted layer at about 10 to 12 inches in depth. Although there is substantial soil movement and gullying on surrounding areas, especially on cattle and game trails, vegetative cover is generally adequate to prevent serious erosion on the study site.

The mountain brush slope is extremely diverse with 17 browse species encountered. The dominant species on the site include Utah serviceberry, antelope bitterbrush, mountain big sagebrush, and curlleaf mountain mahogany. Wood's rose and snowberry are also common. Serviceberry had a population density of 4,799 plants/acre in 1988. Nearly all (98.6%) of these shrubs were classified as young plants. Seedlings were also abundant. This artificially inflated population returned to a more sustainable level by 1994 when 1,180 mostly mature plants were estimated. Mature plants averaged two and one-half feet in height with a crown diameter of almost three feet. Utilization was mostly light with a few individuals displaying moderate to heavy use. By 1999, the population has declined to 680 plants/acre. Use is mostly moderate to heavy, vigor normal, and percent decadence low at only 12%. Some of the differences in density between years may be partly due to the larger sample used in 1994 and 1999, and counting stems instead of whole plants.

Antelope bitterbrush had a density of 2,720 mostly mature plants/acre in 1994. Utilization is light to moderate, vigor is good and there were few decadent individuals. The mature shrubs averaged about 1 foot in height with a three foot crown. There were few young and no seedlings reported in 1988 or 1994. In 1999, density was estimated at 1,980 plants/acre, 75% of which are represented by low, prostrate mature plants. Utilization is moderate to heavy with nearly half of the population showing heavy use with a clubbed growth form. Young plants are common, vigor is good and decadent plants are rare. Some of the difference in density between 1994 estimates and 1999 counts may be caused by the difficulty in counting this large, prostrate shrub. In some instances, it is hard to tell where one plant stops and another starts.

Mountain big sagebrush appears to have a stable population of about 2,200 plants/acre that are mostly lightly hedged. Recruitment is adequate and percent decadency is fairly low at 23% in 1994 and only 10% in 1999. Black sagebrush has increased in density from 300 plants/acre in 1994 to 1,280 by 1999. This site appears to be a marginal one for mountain big sagebrush. Poor vigor was common in 1988 for both species and several mountain big sagebrush plants sampled in 1999 were chlorotic. Recall the very low amounts of phosphorus in the soil. The compaction layer found in the soil profile at 10 to 12 inches in depth may be a partial rooting barrier for mountain big sagebrush.

Curlleaf mountain mahogany made up 25% of the shrub cover in 1994 and 28% in 1999. There is currently an estimated 800 plants/acre with a good mix of tall partly available mature plants and shorter all available mature and young plants. Utilization has been light in the past, but current use is moderate to heavy. There is also a small population of heavily hedged true mountain mahogany. This along with rabbitbrush, Wood's rose, and snowberry provide some additional browse forage. A few scattered pinyon and limber pine are also found on the site.

Diversity is also high in the herbaceous component of the community. Eleven species of grass were identified in 1994 and 1999. Although combined all together they only provided 8% cover in 1994 and 7% in 1999. Of those, Salina wildrye is the most abundant. It accounted for 61% of the grass cover in 1994 and 43% in 1999. Diversity of forbs is excellent with 31 different species found in 1994 and 28 in 1999. Many are valuable forage species. Indian paintbrush, penstemon, redroot and sulfur eriogonum, and Oregon fleabane are most often utilized. Two low value forbs, rock goldenrod and desert phlox, provide nearly half of the forb cover.

1994 TREND ASSESSMENT

Bare ground and litter cover have both decreased. At this time vegetative cover offers as much protection to the soil as does the litter. Most of the vegetative cover (58%) comes from browse, but there is also an abundant herbaceous component which has increased in nested frequency since 1988. Soil trend is slightly up. Most preferred browse species appear to have stable mature populations, although mountain big sagebrush and black sagebrush have increased decadency rates. Several additional species were picked up in the shrub density strips due to the lengthening of the baseline in 1994. This new larger sample gives a better, more representative sample of the area. The browse trend is stable. Grasses are shifting toward more native and palatable species for both livestock and big game. Sum nested frequency of grasses increased slightly since 1988. There was a large increase in summed nested frequency for forbs, most of which offer moderate ground cover. The herbaceous understory trend is slightly up.

TREND ASSESSMENT

<u>soil</u> - slightly up<u>browse</u> - stable<u>herbaceous understory</u> - slightly up

1999 TREND ASSESSMENT

Trend for soil is up slightly. Percent cover of bare ground has declined and litter cover has increased. Vegetation cover has also increased but the improvement comes entirely from shrub cover which is less effective at protecting the soil. Rock and pavement cover have doubled since 1994 which may indicate some soil loss. Trend for the key browse species, serviceberry, mountain big sagebrush and curlleaf mountain mahogany, are considered stable. Utilization is moderate to heavy on serviceberry and curlleaf, but vigor remains good and percent decadence low. Mountain big sagebrush shows mostly light use. Vigor has improved and percent decadence has declined from 23% to 10%. Trend for the herbaceous is stable. Sum of nested frequency for perennial grasses and forbs have declined slightly but the dominant species, Salina wildrye, rock goldenrod, and desert phlox which provide 53% of the herbaceous cover, have remained stable.

TREND ASSESSMENT

<u>soil</u> - up slightly <u>browse</u> - stable <u>herbaceous understory</u> - stable

Herd unit 16C, Study no: 30								
T Species	Nested	Freque	ncy	Quadra	t Freque	ency	Avei	_
y p	'88	'94	'99	'88	'94	'99	Cove	er % 199
e								
G Agropyron cristatum	-	1	4	-	1	2	.03	.03
G Agropyron trachycaulum	32	52	41	14	19	19	1.06	.26
G Aristida purpurea	-	-	1	-	-	1	-	.00
G Bouteloua gracilis	-	1	-	-	1	-	.00	-
G Carex spp.	_a 6	_b 35	_a 16	2	14	7	.41	.37
G Elymus salina	_b 251	_a 173	_a 169	87	69	68	5.05	4.10
G Koeleria cristata	10	5	1	3	2	1	.06	.00
G Oryzopsis hymenoides	10	12	10	4	5	4	.10	.09
G Poa fendleriana	_a 63	_b 85	_{ab} 76	29	37	30	1.14	1.08
G Sitanion hystrix	1	7	3	1	3	1	.04	.00
G Stipa comata	7	8	2	5	3	1	.04	.00
G Stipa lettermani	a-	_b 31	_c 66	-	12	23	.57	1.25
Total for Annual Grasses	0	0	0	0	0	0	0	0
Total for Perennial Grasses	380	410	389	145	166	157	8.53	7.24
Total for Grasses	380	410	389	145	166	157	8.53	7.24
F Antennaria microphylla	-	-	3	-	-	2	-	.03
F Arenaria fendleri	a ⁻	_{ab} 5	_b 9	-	2	4	.03	.24
F Astragalus convallarius	2	13	1	1	5	1	.11	.01
F Astragalus coltoni	a-	_b 24	a ⁻	-	11	-	.37	-
F Astragalus miser	a ⁻	ь7	a ⁻	-	5	-	.15	-
F Aster spp.	-	-	4	-	-	2	-	.01
F Astragalus spp.	_a 10	_{ab} 19	ь33	5	8	17	.16	.99
F Caulanthus crassicaulis	3	-	-	2	-	-	-	1
F Castilleja linariaefolia	_b 62	_{ab} 29	_a 28	29	14	15	.19	.22
F Calochortus nuttallii	-	3	-	-	1	-	.00	-
F Chaenactis douglasii	_b 23	_a 1	_{ab} 19	12	1	8	.00	.06
F Cirsium spp.	1	6	8	1	4	4	.04	.10
F Crepis acuminata	13	6	4	7	3	3	.01	.01
F Cryptantha spp.	1	-	-	1	-	-	-	1
F Cymopterus spp.	2	2	-	1	2	-	.01	1
F Erigeron eatonii	40	48	35	21	22	17	.33	.18
F Erigeron flagellaris	_	-	3	_	_	1	_	.00
F Erigeron spp.	a ⁻	a ⁻	_b 9	-	-	4	-	.04
F Erigeron pumilus	8	8	4	3	4	1	.02	.15
F Eriogonum racemosum	-	42	36	-	19	17	.27	.26
F Erigeron speciosus	_b 16	_c 29	a ⁻	6	12	-	.33	-
F Eriogonum umbellatum	a-	_b 9	_b 14	-	5	6	.22	.30
F Hymenopappus filifolius	_b 10	a ⁻	_a 2	7	-	1	-	.03

T	Species	Nested	Freque	ncy	Quadra	t Freque	ency	Ave	_
y p e		'88	'94	'99	'88	'94	'99	Cove 194	er % (99
F	Hymenoxys richardsonii	28	25	17	15	12	9	.08	.14
F	Lesquerella spp.	7	18	20	6	10	9	.05	.09
F	Lithospermum incisum	-	5	1	-	2	-	.01	-
F	Linum lewisii	-	2	-	-	2	-	.01	-
F	Lupinus spp.	2	10	8	2	5	4	.08	.16
F	Machaeranthera canescens	_b 46	_{ab} 18	_a 11	20	11	5	.10	.10
F	Machaeranthera grindelioides	_b 37	_a 11	_a 8	16	6	4	.08	.07
F	Oxytropis lambertii	_b 22	_a 1	a ⁻	11	1	-	.00	-
F	Penstemon carnosus	34	39	33	18	16	18	.18	.68
F	Penstemon spp.	33	39	35	14	20	16	1.21	.81
F	Petradoria pumila	_a 19	_b 63	_b 56	11	24	24	2.26	2.49
F	Phlox austromontana	_ a	ь71	_b 71	-	26	27	1.92	2.25
F	Polygonum douglasii (a)	-	11	6	-	4	2	.02	.01
F	Senecio multilobatus	_a 3	_{ab} 5	_b 14	1	3	8	.01	.07
F	Taraxacum officinale	4	-	3	2	-	2	-	.01
To	otal for Annual Forbs	0	11	6	0	4	2	0.01	0.00
To	otal for Perennial Forbs	426	558	488	212	256	229	8.32	9.57
To	otal for Forbs	426	569	494	212	260	231	8.35	9.59

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --

Herd unit 16C, Study no: 30

T y p e	Species	Str Frequ Ø4	ip iency (99	Aver Cove 194	U
В	Amelanchier utahensis	29	23	3.10	2.87
В	Artemisia nova	7	21	.42	.91
В	Artemisia tridentata vaseyana	66	50	2.99	5.00
В	Cercocarpus ledifolius	24	26	5.79	7.88
В	Cercocarpus montanus	5	5	.00	.21
В	Chrysothamnus depressus	19	17	.28	.37
В	Chrysothamnus viscidiflorus	21	19	.69	.45
В	Eriogonum corymbosum	3	2	.15	.03
В	Gutierrezia sarothrae	14	12	.21	.10
В	Juniperus osteosperma	-	-	.15	-
В	Leptodactylon pungens	8	8	.15	.36
В	Pinus edulis	0	1	.15	-
В	Purshia tridentata	33	37	4.69	4.87
В	Rosa woodsii	13	13	.82	.96
В	Symphoricarpos oreophilus	36	41	3.26	4.06
В	Tetradymia canescens	1	1	.03	-
В	Yucca baileyi navajoa	7	7	.09	.16
To	otal for Browse	286	283	23.03	28.29

CANOPY COVER ---

Herd unit 16C, Study no: 30

Species	Percent Cover 199
Amelanchier utahensis	3
Cercocarpus ledifolius	11
Pinus edulis	2

BASIC COVER --

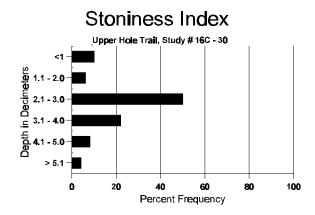
Herd unit 16C, Study no: 30

Cover Type		sted iency	Ave	rage Cove	er %
	0 94	1 99	'88	'94	'99
Vegetation	316	315	13.25	38.02	42.09
Rock	128	109	.50	3.47	5.51
Pavement	94	135	0	.59	2.87
Litter	380	383	55.50	38.12	52.62
Cryptogams	1	3	.25	.03	.03
Bare Ground	281	244	30.50	26.51	21.57

SOIL ANALYSIS DATA --

Herd Unit 16C, Study # 30, Study Name: Upper Hole Trail

Effective rooting depth (inches)	Temp °F (depth)	pН	%sand	%silt	%clay	%0M	PPM P	РРМ К	dS/m
15.1	54.0 (14.4)	7.3	44.0	22.2	33.8	2.6	2.6	54.4	0.6



PELLET GROUP DATA --

Herd unit 16C, Study no: 30

Туре	_	drat iency 1 99
Rabbit	15	48
Elk	3	14
Deer	3	3
Cattle	5	8

Pellet Transect Days Use/Acre (ha)
n/a
32 (79)
5 (12)
31 (77)

Herd unit 16C, Study no: 30

		nit 16C, S															
	Y R	Form Cl	ass (No	o. of P	lants)					V	igor Cl	ass			Plants Per Acre	Average (inches)	Total
E	K	1	2	3	4	5	6	7	8	9	1	2	3	4	rei Acie	Ht. Cr.	
Ar	mela	nchier uta	ahensis	3												I.	
_	88	19	1	-	-	-	_	_	-	-	20	-	-	-	1333		20
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0		(
-	99	3	-	-	3	-	-	-	-	-	6	-	-	-	120		(
	88 94	67 8	4	-	4	-	-	- 1	-	-	71 13	-	-	-	4733 260		71 13
	9 9	4	5	3	2	-	1	-	-	-	15	-	-	-	300		15
M	88	-	1	_	_	-	-	_	-	-	1	-	_	-	66	27 12	. 1
	94	36	4	1	4	-	-	-	-	-	45	-	-	-	900	29 31	45
-	99	-	9	1	1	1	1	2	-	-	15	-	-	-	300	80 81	+
	88 94	-	- 1	-	-	-	-	-	-	-	- 1	-	-	-	0 20		0
	94 99	-	1 2	2	-	-	-	-	-	-	1 2	-	-	2	80		4
_	88	_	_	_	_	_	_	_	_	_	_	_	_	-	0		(
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
J	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	Plar	nts Showi	ng	Mod 07%	<u>derate</u>	Use		ivy Us	<u>e</u>		Vigor					<u>%Change</u> -75%	
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A G		Form C	lass (N	o. of P	lants)					V	igor Cl	ass			Plants Per Acre	Average (inches)	Total
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Y		12	-	-	1	-	-	-	-	-	12	-	1	-	866		13
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	94	-	-	-	-	-	-	-	-	-	-	-	-	-	260		13
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%	Pla	nts Show			<u>derate</u>	Use		ivy Us	<u>se</u>		r Vigor					%Change	
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A	Y R	Form Cl	ass (N	o. of P	lants)						Vigor Cla	ass			Plants Per Acre	Average	Total
E	K	1	2	3	4	5	6	7	8	9	1	2	3	4	Per Acre	(inches) Ht. Cr.	
C	ercoc	arpus mo	ontanu	s													
S	88	-	-	-	-	-	-	-	-	,	-	-	-	-	0		0
	94 99	2	-	-	-	-	-	-	-	-	2	-	-	-	0 40		0 2
Y	88				-					_				_	0		0
I	00 94	-	-	-	-	-	-	3	-	-	3	-	-	-	60		3
	99	-	1	-	-	-	-	-	-	-	1	-	-	-	20		1
M		-	-	-	-	-	-	-	-	-	_	-	-	-	0		0
	94 99	2	8	- 6	-	-	2	1	-	-	9 10	-	-	-	180 200	25 37 20 24	9 10
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		'94 '99		67% 09%			00% 73%			00					-	- 8%	
										00	70						
T	otal I	Plants/Ac	re (ex	cluding	Dead	& Se	edling	s)					'88 '94		0 240	Dec:	-
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C	hryso	othamnus	depre	ssus													
Y	88	-	-	-	_	-	-	_	-	-	-	-	-	-	0		0
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		'94		18%												5470	
		'94 '99		18% 45%			189			03						J+70	
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Т	otal I	'99		45%	Ď	l & Se	18%	6					'88 '94 '99				0% 8% 24%

A G	Y R	Form Cl	ass (N	o. of F	Plants)					,	Vigor Cla	ass			Plants Per Acre	Average (inches)		Total
E	IX	1	2	3	4	5	6	7	8	9	1	2	3	4	T CI ACIC	Ht. Cr.		
Cl	hrvsc	othamnus	viscid	iflorus	3													
Y	88	3	1	1							4	_	1	_	333			5
1	94	2	_	1	-	-	-	-	-		2	-	-	-	40			2
	99	1	_	_	_	_	_	_	_	-	1	_	_	_	20			1
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	9 4 99	6	13	1	2	-	_	_	-	-	19	_	3	-	440	12	13	22
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D	88	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	94 99	1 1	2	- 1	1	-	-	-	-	1	2 3	-	-	2	40 100			2 5
					-	-	-	-	-	1		-	-	2				3
%	Plar	nts Showi	ng		<u>derate</u>	Use		vy Us	<u>se</u>		or Vigor				<u>.</u>	%Change		
		'88		069			06%			569						27%		
		'94 '99		05%			00%			000					-	-28%		
		99		549	0		11%	0		189	70							
Т	otal I	Plants/Ac	re (exc	ludino	Dead	1 & Se	edling	s)					'88		1065	Dec:		6%
l ' '	Jul 1	. 141113/110	io (cae		5 Deal		cumig	<i>-)</i>					'94		780	Dec.		5%
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F.	ioco	num cory	mhoa	ım														
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%	99	2 nts Showi	-		- derate	Use		- ivy Us	- se	- <u>Po</u>	2 or Vigor	-	-	-	40			2
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Т	99 Plar otal I	2 hts Showi '88 '94 '99 Plants/Act	ng re (exc	009 149 009	<u>-</u> <u>derate</u> 6 6 6		00% 00% 00%	6 6 6	- 6 <u>e</u>	- Poo	2 or Vigor %	-	'94	-	40 9 0 140	7 %Change -71%		-
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To S Y	99 Plar witter. 88 94 99 88 94 99 88 94 99	2 hts Showi '88 '94 '99 Plants/Act rezia saro 1 - 2 7 1 20 27 hts Showi '88 '94	thrae	- - - - - - - - - - - - - -	derate 6 6 6 7 7 8 7 8 8 8 9 8 9 8 9 8 9 8 9 8 9 8 9			- - - - - - - - - - - - 6 6	- - - - - -	- Poo	2 or Vigor % % % % % % % % % % % % % % % % % % %	- - - - - - -	'94		0 140 40 0 0 20 0 40 140 66 440 540	7 %Change 71% Dec: 6 6 6 6 %Change	18 2 6	0 0 0 1 0 2 7
To S Y	99 Plar witter. 88 94 99 88 94 99 88 94 99	2 Ints Showi '88 '94 '99 Plants/Act rezia saro 1 - 2 - 7 1 20 27 Ints Showi '88	thrae		- derate 6 6 6 7 7 7 7 7 7 7 8 7 8 8 9 8 9 9 9 9 9 9 9		- - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - 6 6	- - - - - -	- Poe 00° 00° 00°	2 or Vigor % % % % % % % % % % % % % % % % % % %	- - - - - - -	'94		0 140 40 0 0 20 0 40 140 66 440 540	7 %Change 71% Dec: 6 6 6 6 6 %Change +86%	18 2 6	0 0 0 1 0 2 7
To S	99 Plar utier 88 94 99 88 94 99 Plar	2 hts Showi '88 '94 '99 Plants/Act rezia saro 1 - 2 7 1 20 27 hts Showi '88 '94 '99	thrae		- derate 6 6 7 7 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9				- - - - - -	- Pool 00° 00°	2 or Vigor % % % % % % % % % % % % % % % % % % %	- - - - - - -	'94 '99 - - - - - -		0 140 40 0 0 20 0 40 140 66 440 540	7 %Change 71% Dec: 6 6 6 6 8Change +86% +29%	18 2 6	0 0 0 1 0 2 7
To S Y	99 Plar utier 88 94 99 88 94 99 Plar	2 hts Showi '88 '94 '99 Plants/Act rezia saro 1 - 2 7 1 20 27 hts Showi '88 '94	thrae		- derate 6 6 7 7 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9				- - - - - -	- Pool 00° 00°	2 or Vigor % % % % % % % % % % % % % % % % % % %	- - - - - - -	'94 '99		0 140 40 0 0 20 0 40 140 66 440 540	7 %Change 71% Dec: 6 6 6 6 6 %Change +86%	18 2 6	0 0 1 0 2 7
To S	99 Plar utier 88 94 99 88 94 99 Plar	2 hts Showi '88 '94 '99 Plants/Act rezia saro 1 - 2 7 1 20 27 hts Showi '88 '94 '99	thrae		- derate 6 6 7 7 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9				- - - - - -	- Pool 00° 00°	2 or Vigor % % % % % % % % % % % % % % % % % % %		'94 '99 - - - - - -		0 140 40 0 0 20 0 40 140 66 440 540	7 %Change 71% Dec: 6 6 6 6 8Change +86% +29%	18 2 6	0 0 0 1 0 2 7

A G	Y R	Form Cla	ass (N	o. of P	Plants)						Vigor Cl	ass			Plants Average Per Acre (inches)			Total
E	10	1	2	3	4	5	6	7	8	9	1	2	3	4		Ht. Cr.		
L	ptod	actylon p	ungen	ıs														
Y	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94 99	1 2	-	-	-	-	-	-	-	-	1 2	-	-	-	20 40			1 2
Μ		-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	29	-	-	-	-	-	-	-	-	29	-	-	-	580	13	8	29
Ļ	99	36	-	-	-	-	-	-	-	-	36	-	-	-	720	6	7	36
D	88 94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
%	Plan	ts Showi	ng		derate	Use		avy Us	se_		oor Vigor %Change							
		'88		00%			009)%							
		'94 '99		00% 00%			009 009			00					-	+25%		
		99		00%	0		009	0		00)%							
Т	otal F	Plants/Acr	e (exc	cluding	g Dead	& Se	edling	s)					'88		0	Dec:		0%
													'94		600			0%
													'99		800			5%
Pi	nus e	edulis																
Y	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
%	Plan	ts Showin	ng		<u>derate</u>	Use		avy Us	<u>se</u>		or Vigor				-	%Change		
		'88		00%			009)%							
		'94 '99		00%			009			00								
		99		00%	0		009	0		00	J%0							
Т	otal F	Plants/Acı	e (exc	cluding	g Dead	& Se	edling	s)					'88		0	Dec:		-
			`				0	,					'94		0			-
L													'99		20			-

A	Y	Form C	lass (N	lo. of F	Plants)	1					Vigor Cl	ass			Plants	Average	Total			
G E	R	1	2	3	4	5	6	7	8	9	1	2	3	4	Per Acre	(inches) Ht. Cr.				
Pι	ırshi	a tridenta	ata													•	•			
S	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	99	3	-	-	-	-	-	-	-	-	3	-	-	_	60		3			
Y	88 94	8 8	1 -	-	-	-	-	-	-	-	9 8	-	-	-	600 160		9			
	99	2	12	6	1	_	_	1	_	-	22	_	-	_	440		22			
Μ	88	_	6	_	1	_	_	_	_	_	7	_	_	_	466	12 39				
	94	101	23	1	2	-	-	-	-	-	123	4	-	-	2540	11 36	127			
	99	1	22	19	-	10	22	-	-	-	74	-	-	-	1480	16 38	74			
D	88	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1			
	94 99	2	1	-	1	-	-	-	-	-	1 1	-	-	2	20 60		1 3			
X	88				1						-				0		0			
Λ	94	_	-	-	-	-	-	-	-	-	-	-	_	_	0		0			
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4			
%	Plar	nts Show			derate	<u>Use</u>		avy Us	<u>se</u>		oor Vigor					%Change				
		'88		419			009)%					+58%				
		'94 '99		189 449			.73° 479)% 2%		-27%							
		,,,		,			.,,	Ü		02	2,0									
Т	otal I	Plants/Ac	ere (ex	cluding	g Dead	d & Se	edling	s)					'88		1132	Dec:	6%			
													'94 '99		2720 1980		1% 3%			
D.	oca v	voodsii											,,,		1700		370			
S	88	voodsii													0		0			
3	94	_	-	-	_	-	-	-	-	-	-	-	-	_	0		0			
	99	37	-	-	2	-	-	-	-	-	39	-	-	-	780		39			
Y	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	94	23	-	-	4	-	-	-	-	-	27	-	-	-	540		27			
	99	52	-	-	11	-	-	4	-	-	67	-	-	-	1340		67			
M	88 94	62	-	-	- 64	-	-	-	-	-	126	-	-	-	0 2520		126			
	94 99	21	-	-	12	-	-	4	-	-	37	-	-	-	740					
%		nts Show	ing	Mo	derate	Use	Hea	ıvy Us	se	Po	oor Vigor					%Change				
		'88		009	%		009	6		00)%				_					
		'94		009			009)%					-32%				
		'99	•	009	%		009	6		00)%									
Т	otal I	Plants/Ac	ere (ex	cluding	g Dead	1 & Se	edling	s)					'88		0	Dec:	-			
			`	•	_		8	,					'94		3060		-			
													'99		2080		-			

A	Y	Form Cl	ass (N	o. of I	Plants)						Vigor Cl	ass			Plants	Average		Total		
G E	R	1	2	3	4	5	6	7	8	9	1	2	3	4	Per Acre	(inches) Ht. Cr.				
S	mph	oricarpos	s oreoj	hilus												•				
S	88	11	-	-	-	-	-	-	-	-	11	-	-	-	733			11		
	94 99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0 7		
L		4	-	-	-	-	-	3	-	-	7	-	-	-	140					
Y	88 94	22 5	-	-	3	-	-	-	-	-	22 8	-	-	-	1466 160			22 8		
	99	10	3	_	11	_	_	2	-	-	26	_	-	_	520			26		
Μ	88	1	_	-	_	-	-	_	-	-	1	_	-	_	66	64	43	1		
	94	63	8	-	30	-	5	2	-	-	108	-	-	-	2160		24	108		
	99	39	-	-	20	-	-	1	-	-	60	-	-	-	1200	17	27	60		
D	88 94	-	- 1	-	-	-	-	-	-	-	2	-	-	-	0 40			0 2		
	9 4 99	1	1 1	_	-	-	-	_	-	-	1	-	-	-	20			1		
%		nts Showi		Mo	derate	Use	Hea	ıvy Us	ie	Po	oor Vigor %Change									
		'88	8	009			009		_	00						+35%				
		'94		089			049		00			-26%								
		'99		059	%		009	6		00)%									
Т	otal I	Plants/Act	re (exc	cludin	g Dead	& Se	edling	s)					'88 '94		1532 2360	Dec:		0% 2%		
													'99		1740			1%		
Т	etrad	ymia can	escens																	
Y	88	7	-	-	-	-	-	-	-	-	7	-	-	-	466			7		
	94	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2		
L	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20		_	1		
M	88 94	3	-	-	-	-	-	-	-	-	3	-	-	-	200 0	5 4	6 6	3		
	9 4 99	-	-	-	-	-	-	_	-	-	-	-	-	-	0	-	-	0		
%	Plar	nts Showi	ng	Mo	derate	Use	Hea	ıvy Us	se	Po	or Vigor				(%Change				
		'88	υ	009	%	,	009	6		00)%				-	-94%				
		'94		009			009			00					-	-50%				
		'99		009	%		009	6		00)%									
Т	otal I	Plants/Ac	re (exc	cludin	g Dead	& Se	edling	s)					'88		666	Dec:		-		
	Total Plants/Acre (excluding Dead & Seedlings)												'94		40			-		
ĺ													'99		20			-		

	Y	Form Cla	ass (N	o. of P	Plants)						Vigor Cl	ass			Plants	Average		Total
G E	R	1	2	3	4	5	6	7	8	9	1	2	3	4	Per Acre	(inches) Ht. Cr.		
Y	ucca	baileyi na	avajoa	l														
Y	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
	99	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	88	1	-	-	-	-	-	-	-	-	1	-	-	-	66	9	10	1
	94	5	-	-	-	-	-	-	-	-	5	-	-	-	100	8	10	5
	99	6	-	-	-	-	-	-	-	-	7	-	-	-	140	6	12	7
X	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
%	Plan	nts Showi	ng	Mo	derate	Use	Hea	avy Us	se	Po	oor Vigor				(%Change	;	
		'88		009	6		009	6		00)%					+79%		
		'94		00%	6		009	6		00)%					+ 0%		
		'99		00%	6		009	6		00)%							
т	-4-1 F	214-/4	(.11!.	- D-	100		-)					100)		D.		
10	otai F	Plants/Acr	re (exc	ciuaing	g Dead	ı & Se	eanng	s)					'88		66			-
													'94		320			-
													'99	,	320			-